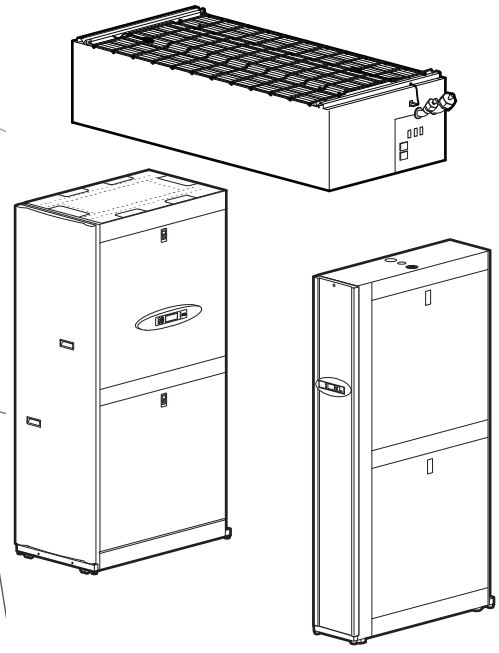
APC™
by Schneider Electric

Operation and Maintenance

Pumped Refrigerant System Refrigeration Distribution Unit (RDU) and Cooling Modules

ACDA901
ACOA500
ACOA501
ACRA100
ACRA101



This manual is available in English on the enclosed CD.

Dieses Handbuch ist in Deutsch auf der beiliegenden CD-ROM verfügbar.

Deze handleiding staat in het Nederlands op de bijgevoegde cd.

Este manual está disponible en español en el CD-ROM adjunto.

Ce manuel est disponible en français sur le CD-ROM ci-inclus.

Questo manuale è disponibile in italiano nel CD-ROM allegato.

本マニュアルの日本語版は同梱の CD-ROM からご覧になれます。

Instrukcja Obsługi w jezyku polskim jest dostepna na CD.

O manual em Português está disponível no CD-ROM em anexo.

Данное руководство на русском языке имеется на прилагаемом компакт-диске.

您可以从包含的 CD 上获得本手册的中文版本。

동봉된 CD 안에 한국어 매뉴얼이 있습니다 .

American Power Conversion Legal Disclaimer

The information presented in this manual is not warranted by the American Power Conversion Corporation to be authoritative, error free, or complete. This publication is not meant to be a substitute for a detailed operational and site specific development plan. Therefore, American Power Conversion Corporation assumes no liability for damages, violations of codes, improper installation, system failures, or any other problems that could arise based on the use of this Publication.

The information contained in this Publication is provided as is and has been prepared solely for the purpose of evaluating data center design and construction. This Publication has been compiled in good faith by American Power Conversion Corporation. However, no representation is made or warranty given, either express or implied, as to the completeness or accuracy of the information this Publication contains.

IN NO EVENT SHALL AMERICAN POWER CONVERSION CORPORATION, OR ANY PARENT, AFFILIATE OR SUBSIDIARY COMPANY OF AMERICAN POWER CONVERSION CORPORATION OR THEIR RESPECTIVE OFFICERS, DIRECTORS, OR EMPLOYEES BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL, OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS, CONTRACT, REVENUE, DATA, INFORMATION, OR BUSINESS INTERRUPTION) RESULTING FROM, ARISING OUT, OR IN CONNECTION WITH THE USE OF, OR INABILITY TO USE THIS PUBLICATION OR THE CONTENT, EVEN IF AMERICAN POWER CONVERSION CORPORATION HAS BEEN EXPRESSLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AMERICAN POWER CONVERSION CORPORATION RESERVES THE RIGHT TO MAKE CHANGES OR UPDATES WITH RESPECT TO OR IN THE CONTENT OF THE PUBLICATION OR THE FORMAT THEREOF AT ANY TIME WITHOUT NOTICE.

Copyright, intellectual, and all other proprietary rights in the content (including but not limited to software, audio, video, text, and photographs) rests with American Power Conversion Corporation or its licensors. All rights in the content not expressly granted herein are reserved. No rights of any kind are licensed or assigned or shall otherwise pass to persons accessing this information.

This Publication shall not be for resale in whole or in part.

Contents

General Information 1

Overview 1

Save these instructions 1

Safety 2

Commissioning 3

Inspection Checklists 3

Initial Inspection Checklist 3
Electrical Inspection Checklist 4
Mechanical Inspection Checklist 5
User Interface Inspection Checklist 6
Start-up Inspection Checklist 7
Final Inspection Checklist 7

Operation 8

The Pumped Refrigerant System 8

System Operation 8
Refrigerant Circulation 8
System Architecture 9
Pumped Refrigerant System Piping Diagram 11
OA Piping Diagram 12
RA Piping Diagram 13

Display Interface 14

Using the Display 15

Scrolling status screens 15
Main menu screens 15
Navigating the screens 16
Sub-menus 16
Using the Path statement 17
Password entry 17
Start the RDU 18
Stop the RDU 18
Start a CM Remotely 18
Stop a CM Remotely 18

General Configuration 19

RDU configuration 19
CM Configuration 21
Identify the cooling modules 22

Group Configuration 23

Modify a Cooling Module (CM) ID 23
View the groups 23
Unassign CMs 23
Configure Modbus 23

Control the Environment 24

Measurements 25
Group PIDs 26
Tune the PID loop 27
RDU (component) run hours 28
Reset RDU run hours 28
CM (component) run hours 28
Reset CM run hours 28
Thresholds 28
Service intervals 29

Display Settings 30

Password and timeout 30
Date and time 30
Identify the RDU by Name and Location 30
Adjust display 31
Display units 31

Network Configuration 32

Configure the network 32

View Status Readings 33

Scrolling status screens 33
Status 33
Cooling group status 36
About the RDU 36

Event Log 37

View event log 37
Clear event log 37

Respond to Alarms 37

View active alarms 37
Clear active alarms 37
Alarm messages and suggested actions 38
CM alarm messages 41

Network Management Card 44

Quick Configuration 44

Overview 44
TCP/IP configuration methods 44
APC Device IP Configuration Wizard 45
.ini file utility 45
BOOTP and DHCP configuration 45
Remote access to the command line interface 46
Command line interface 47

How to Recover from a Lost Password 48

CM Display 49

OA display 49
RA display 49
Display Operation 50

Maintenance 51

Leak Detector 51

Calibration 51

Monthly Preventive Maintenance 52

Environment 52
Cleanliness 52
Mechanical 53
Electrical 53

Quarterly Preventive Maintenance 54

Mechanical 54
Functional tests 54

Semi-Annual Preventive Maintenance 54

Cleanliness 54

Troubleshooting 55

General Information

Overview

The pumped refrigerant system is composed of at least one 160 kW Refrigeration Distribution Units (RDUs) circulating R-134a refrigerant to the Cooling Modules. Each RDU can support multiple overhead or in row Cooling Modules.

Cooling Modules are identified as CMs on the display interface screens of the RDU and in this manual. The exact type of Cooling Module is identified where specificity is required on both the display interface and in this manual.

Note the definitions for the icons here and be observant for them throughout this manual. They are intended to call attention to potential hazards and important information.

Save these instructions

This manual contains important instructions that must be followed during installation, operation, and maintenance of the Rack PDU.

Safety

Read and adhere to the following important safety considerations when working with this unit.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on the equipment. All electrical work should be performed by licensed electricians. Practice lockout/tagout procedures. Do not wear jewelry when working with electrical equipment.

Failure to follow these instructions can result in death or serious injury.

⚠WARNING

HAZARD FROM MOVING PARTS

Keep hands, clothing, and jewelry away from moving parts. Check the equipment for foreign objects before closing the doors and starting the equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠WARNING

DAMAGE TO EQUIPMENT OR PERSONNEL

The equipment is heavy and can easily be tipped. For safety purposes, adequate personnel must be present when moving this equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠CAUTION

HAZARD TO EQUIPMENT OR PERSONNEL

All work must be performed by American Power Conversion (APC®) by Schnieder Electric authorized personnel.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠NOTICE

HAZARD TO EQUIPMENT

Circuit boards contained within this unit are sensitive to static electricity. Use one or more electrostatic-discharge device while handling the boards.

Failure to follow these instructions can result in equipment damage.

Commissioning

After installation, verify that all components are working properly and that the equipment is ready to begin operation.

Inspection Checklists

Initial Inspection Checklist

The initial inspection ensures that the equipment has been properly installed, the location of the equipment has been properly prepared and the equipment is free of damage.

Note: Although it is not necessary for the RDU to be installed in a room with a vapor barrier, the computer room should have one as a vapor barrier minimizes moisture infiltration. Without a vapor barrier, it will be difficult to maintain the humidity in the room. Do not introduce unconditioned outside air into the computer room.

Note: A minimum of 900 mm (36 in) of clear floor space in front of the RDU is required for service access.

❑	Ensure the installation procedure is complete according to the installation manual.
❑	If the RDU is installed in the computer room, ensure that the walls, floor, and ceiling of the room where the equipment is located are sealed with a vapor barrier.
❑	Ensure there is no evidence of damage to the equipment.
❑	Ensure the equipment is level.
❑	Ensure that the equipment is joined to the adjacent racks if it is installed at the end of a row.
❑	Ensure the clearance around the equipment is in accordance with local and national codes and regulations as well as the installation manual.

Electrical Inspection Checklist

The electrical inspection verifies that all electrical connections are secure and correct and that the equipment is properly grounded.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on the equipment. All electrical work should be performed by licensed electricians. Practice lockout/tagout procedures. Do not wear jewelry when working with electrical equipment.

Failure to follow these instructions can result in death or serious injury.

Ensure that the:

❑	Incoming voltages match the phase and voltage listing on the nameplate.
❑	Electrical wiring complies with local and national codes and regulations.
❑	Equipment is properly grounded.
❑	Access doors are properly grounded.
❑	Electrical connections are tight, including contactors, terminal blocks, controllers, switches, relays, auxiliary devices, and field connections.
❑	Circuit breakers are properly connected and securely attached.

Mechanical Inspection Checklist

The mechanical inspection verifies that all mechanical components and connections are secure and tight and ready for start-up and system charging.

Note: Improperly installed piping may result in improper operation and possible damage to the cooling unit or surrounding equipment.

Ensure that the:

❑	Chilled water pipe fittings are tight, and have been leak checked. Leak check pressure can not exceed 300 psi (2068 kpa).
❑	Air is bled from the water system. If air remains in the system, bleed it out now.
❑	Mechanical connections are tight.
❑	Supply chilled water temperature is recorded.
❑	Chilled water flow is correct based on the performance requirements of the RDU.
❑	Field-installed traps and piping are in accordance with the installation manual. Strainers are in place in the chilled water supply loop. Proper piping practices have been followed.
❑	Piping is adequately supported and isolated when necessary.
❑	Field-installed service valves are open.
❑	Water outlet temperature sensor is positioned correctly. See the installation manual for correct positioning.
❑	Piping in the building and on the roof is properly insulated.
❑	Pumped refrigerant piping joints are tight, and have been leak checked. Leak check pressure can not exceed 150 psi (1034 kpa).
❑	Pressure relief valve is installed in accordance with the installation manual as well as local and national codes and regulations.
❑	Refrigerant lines have been evacuated to ensure foreign particles have been removed from the system. Evacuation level must be at a minimum 500 microns for 2 hours.
❑	All piping (chilled water and refrigerant vapor) is properly insulated.
❑	Covers and guards are in place.

User Interface Inspection Checklist

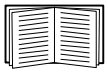
The user interface inspection verifies that the sensors and internal communication links are installed properly. Check that the outdoor heat exchanger is connected to the RDU(s).

Ensure that:

❑	An A-Link bus is connected to each RDU or cooling module (CM) and a terminator is plugged into all unused A-Link connectors.
❑	An A-Link bus is connected to the external temperature and humidity sensor (APC part number AP9520TH).
❑	The input contacts and output relays are connected correctly.
❑	The building management system is connected correctly and a terminator is wired into the RDU between Modbus D0 and Modbus D1.
❑	The temperature sensors located on the equipment are connected correctly.
❑	The rack temperature sensors are installed correctly.
❑	The network port is connected correctly and an IP address has been assigned to the RDU(s).
❑	The optional rope water detection device is installed properly.

Start-up Inspection Checklist

The start-up inspection ensures that the equipment is operating properly after the initial start-up. This inspection verifies that all modes of operation are working correctly and that the equipment is ready for normal operation.



See “Start the RDU” on page 1 for startup information.

While the equipment is operating, ensure that:

- ❑ The unit is free from malfunctions, including chilled water leaks, or other irregularities, in each mode of operation.
- ❑ Both the primary and secondary power inputs can supply power to all functions in the equipment.
- ❑ A pump is operating.
- ❑ Air filters in CMs (RA only) are clean and free of debris. Replace air filters with APC air filters only.

Final Inspection Checklist

The final inspection verifies that the system is clean, the installed options work properly, and the start-up form is sent to APC.

Ensure that:

- ❑ The system is clean and free from debris.
- ❑ Packaging materials are disposed of properly.
- ❑ The start-up form was completed and sent to APC.

Operation

The Pumped Refrigerant System

System Operation

The primary function of the Pumped Refrigerant System is to capture the heat generated by IT equipment and neutralize it before it mixes with the room air. The pumped refrigerant system uses two circuits to remove heat. In the first circuit, water or a water/glycol mixture is pumped from the chiller into a brazed plate heat exchanger located inside the RDU.

In the second circuit, R134a refrigerant circulates from the RDU to Cooling Modules located either over the hot aisle or in the row. Cooling Module fans draw in hot air across their micro channel coil completely evaporating the liquid refrigerant. The refrigerant vapor then returns to the RDU. There the vapor is condensed back into a liquid in the brazed plate heat exchanger which rejects the heat to the chilled water.

The system does only sensible cooling. No energy is wasted in latent energy removal. Less energy is used to satisfy the IT load. A thermal containment system will further increase efficiency. A conventional computer room air conditioner is used in conjunction with the pumped refrigerant system to provide humidity control.

The pumped refrigerant system is flexible. Each system is configured to the user's specific requirements. As cooling needs increase, the system can be expanded. A system may have multiple RDUs. One RDU can supply OA Cooling Modules and RA Cooling Modules.

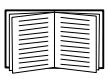
Note: Only APC certified technicians should service the pumped refrigerant system.

Refrigerant Circulation

Each cooling module is connected to the RDU by overhead or under floor refrigerant distribution piping.

Note: Under floor refrigerant piping is not recommended.

Multiple electronic valves in each CM automatically regulate the refrigerant flow and coil temperature to met the IT load at the desired supply air set point.



See the "OA Piping Diagram" on page 1 for the locations of the valves and sensors on the OA Cooling Modules. See "RA Piping Diagram" on page 1 for the locations of the valves and sensors on the RA Cooling Module

Refrigerant is circulated through the system by two fully redundant refrigerant pumps. The RDU display interface allows you to program the number of run hours a pump will operate before switching to the second pump. Pump redundancy ensures that the cooling modules continue to run uninterrupted.

The RDU is equipped with a subcooler to further cool the refrigerant leaving the brazed plate heat exchanger. This additional subcooling allows the refrigerant pumps to operate correctly and efficiently while responding to varying IT loads.

In the absence of an IT load or when all the CMs are turned off, the RDU refrigerant pumps continue to operate by bypassing the refrigerant through a pump head pressure control valve. This head pressure control valve allows continuous operation of the pumps regardless of the load. While in bypass, the refrigerant pumps reduce to a minimum speed allowing minimal power consumption and avoid the wear of frequent starts and stops.

See the "Pumped Refrigerant System Piping Diagram" on page 1 for the locations of the RDU components discussed above.

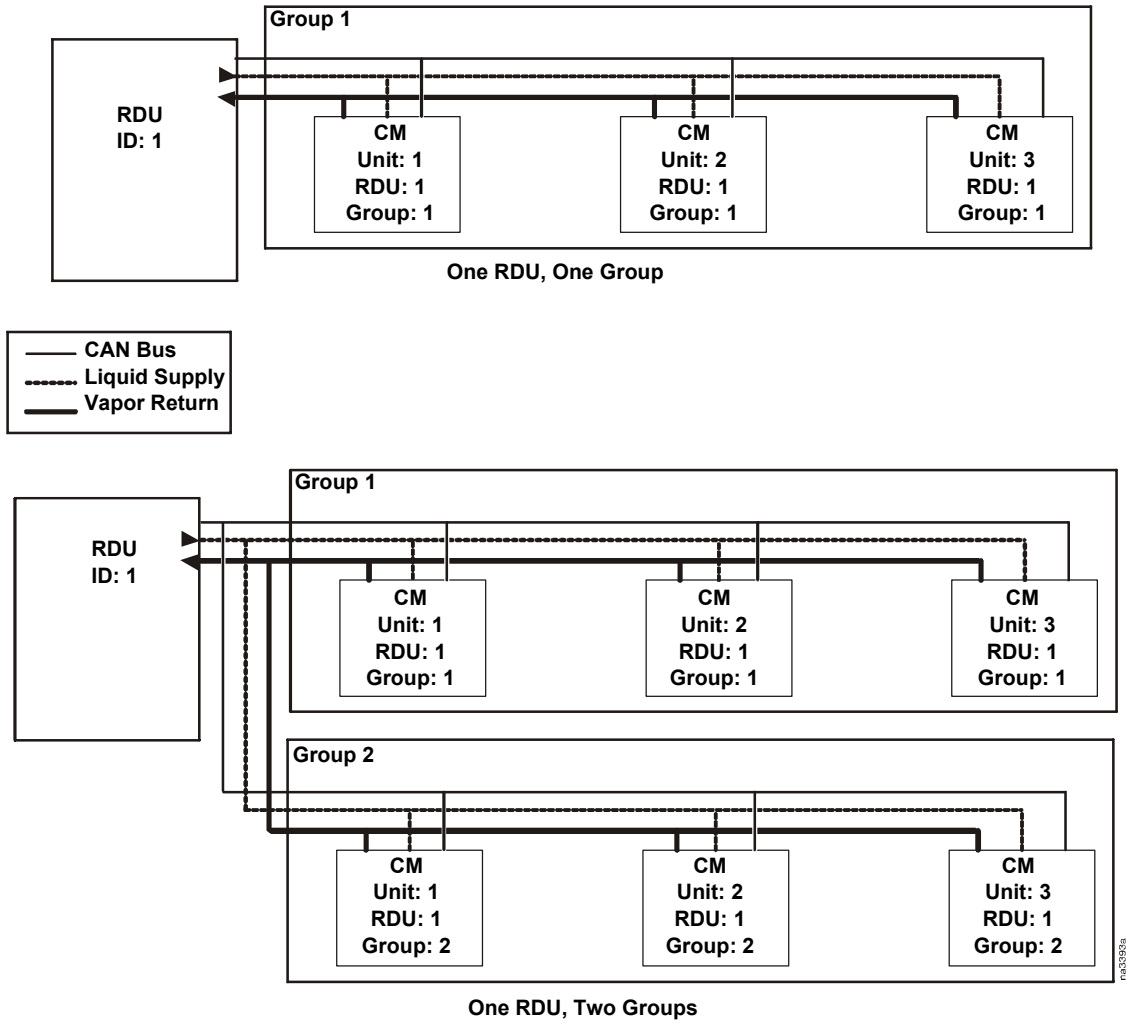
The RDU monitors room conditions to control the refrigerant condensing temperature relative to the room dew point.

See the RDU Installation Manual, OA Installation Manual, and RA Installation Manual for more information.

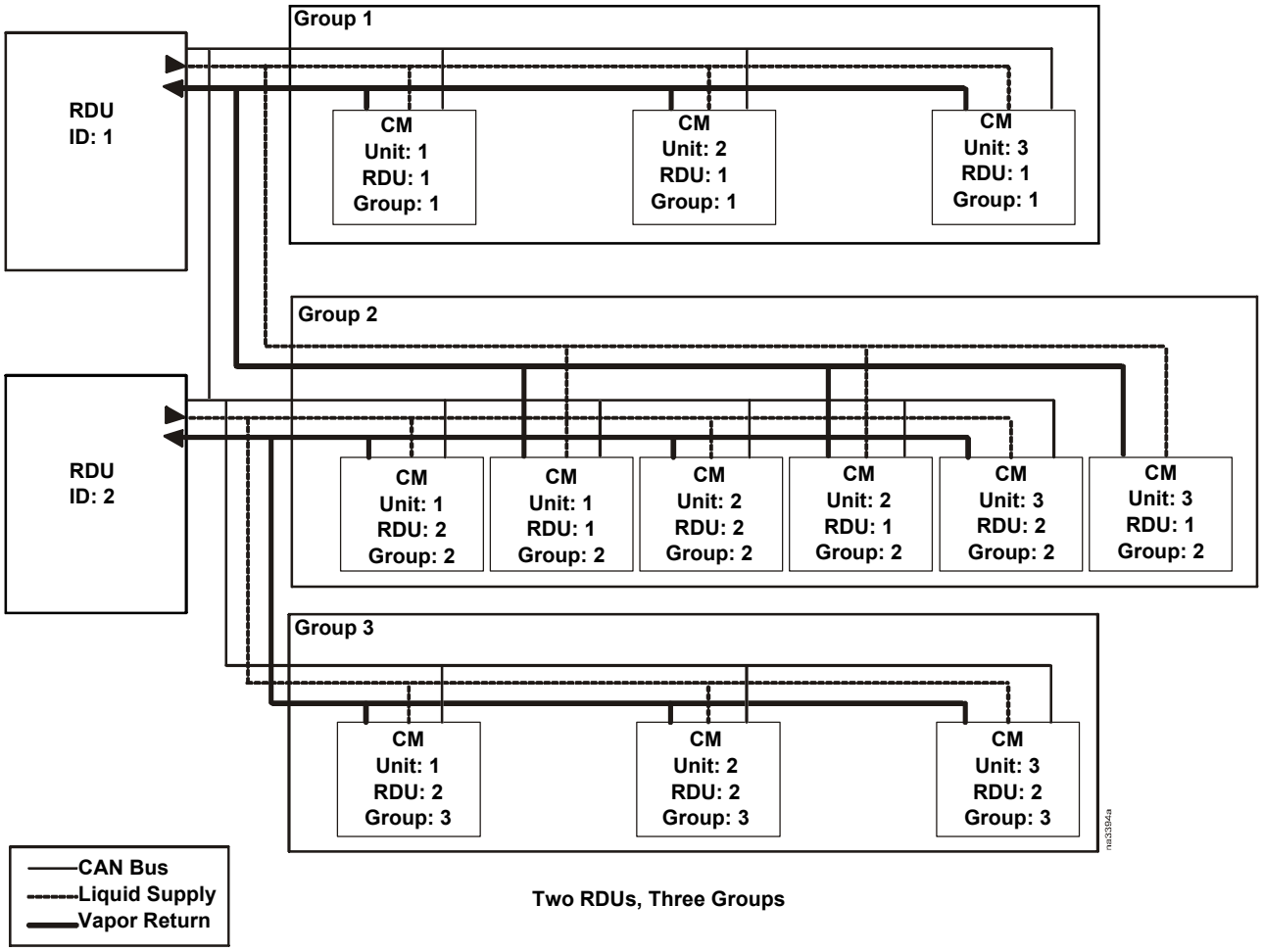
System Architecture

The pumped refrigerant system can be configured based on the customer requirements.

Examples below illustrate group usage with a single RDU.

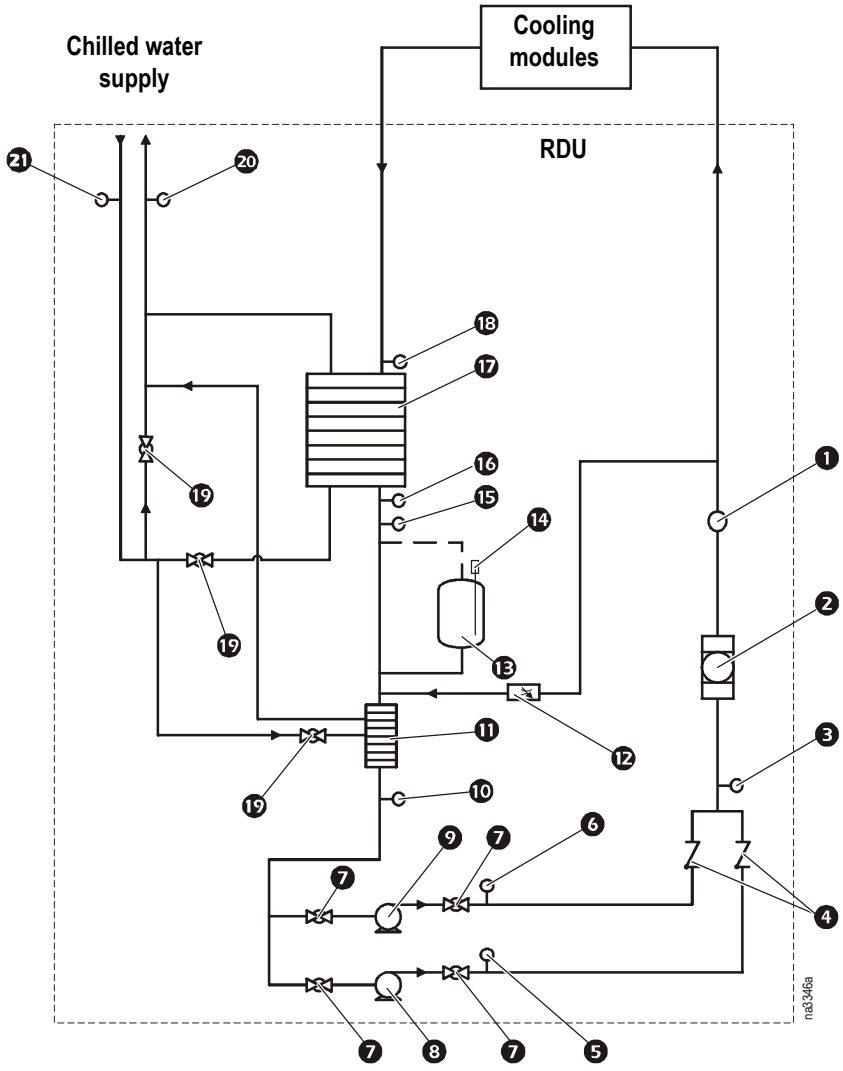


The example below shows two RDUs employed to control three groups of CMs.



Two RDUs, Three Groups

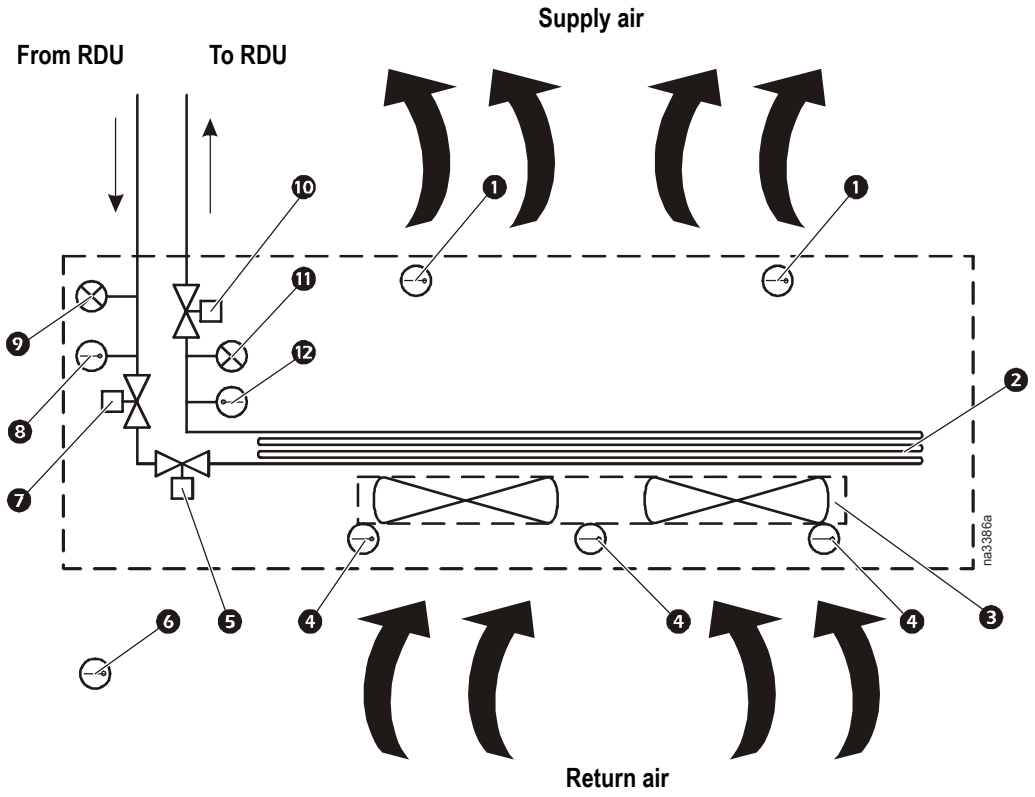
Pumped Refrigerant System Piping Diagram



Item	Description
❶	Sight glass
❷	Filter dryer
❸	Refrigerant pump output temperature sensor
❹	Check valves
❺	Refrigerant pump 2 output pressure sensor
❻	Refrigerant pump 1 output pressure sensor
❼	Isolation valves
❽	Pump 2
❾	Pump 1
❿	Refrigerant subcooler output temperature sensor
⓫	Subcooler

Item	Description
⓬	ORD valve
⓭	Receiver
⓮	Liquid level sensor
⓯	Refrigerant HXGR output temperature sensor
⓰	Refrigerant HXGR output pressure sensor
⓱	Condenser
⓲	Refrigerant HXGR input temperature sensor
⓳	Two-way water ball valves
⓴	Leaving water temperature sensor
㉑	Entering water temperature sensor

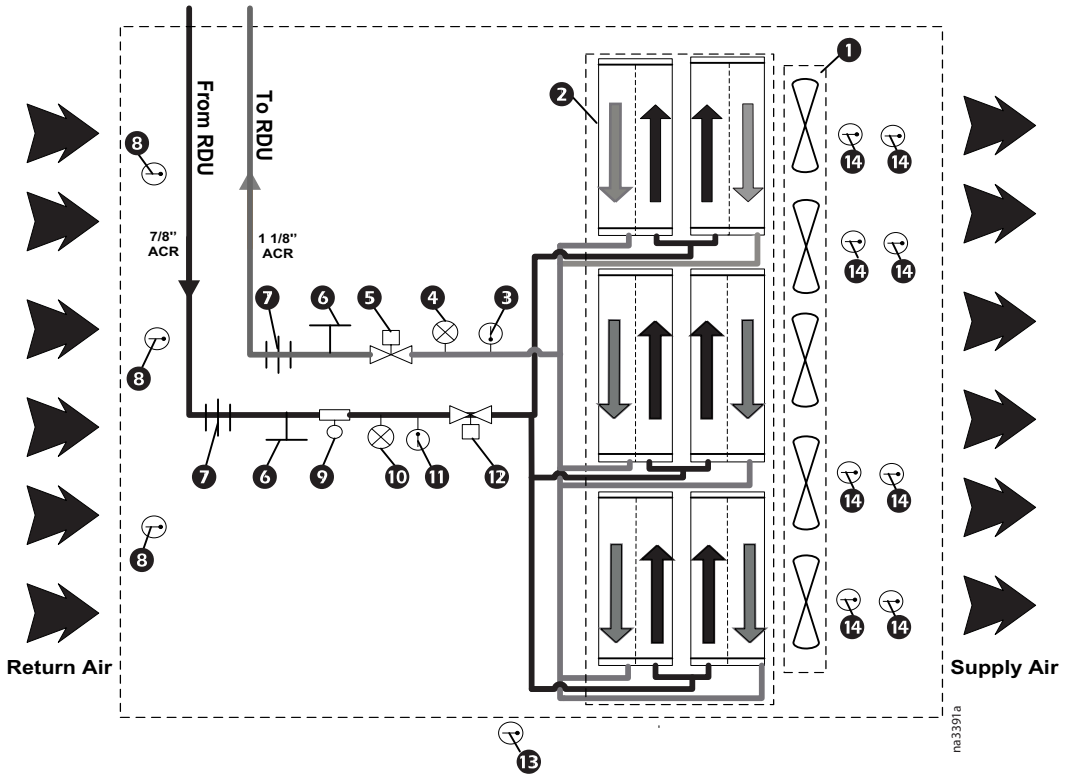
OA Piping Diagram



Item	Description
❶	Supply air temperature sensors
❷	Micro-channel coil
❸	Fans
❹	Return air temperature sensors
❺	Electronic expansion valve (EEV)
❻	Remote rack inlet temperature sensor

Item	Description
❼	Solenoid valve
❽	Supply liquid temperature sensor
❾	Refrigerant liquid pressure sensor
❿	Evaporator pressure regulator (EPR)
⓫	Refrigerant vapor pressure sensor
⓬	Return vapor temperature sensor

RA Piping Diagram

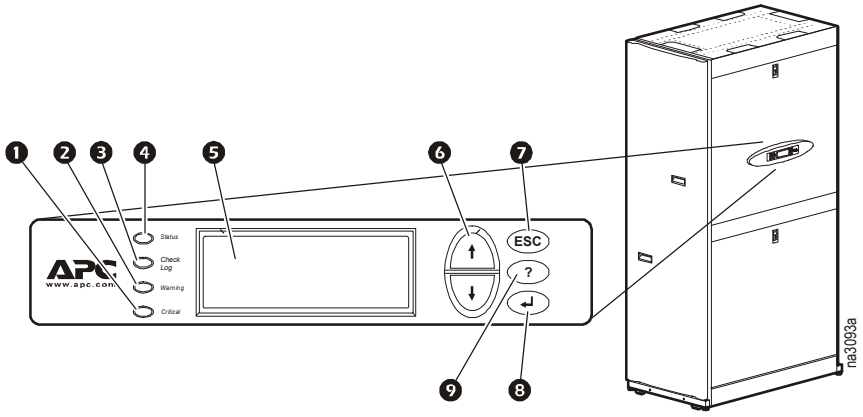


Item	Description
❶	Fan
❷	Micro-channel coil
❸	Return vapor temperature sensor
❹	Refrigerant vapor pressure sensor
❺	Evaporator pressure regulator (EPR)
❻	Service port
❼	Rotalock adapter

Item	Description
❽	Return air temperature sensors
❾	Solenoid valve
❿	Refrigerant liquid pressure sensor
⓫	Supply liquid temperature sensor
⓬	Electronic expansion valve (EEV)
⓭	Remote rack inlet temperature sensor
⓮	Supply air temperature sensors

Display Interface

The display interface in the RDU also displays information pertinent to itself and to other system components. OAs, RAs, and other Cooling Modules are identified as CMs on the display interface screens.



Item	Description	Function
❶	Critical Alarm LED (red)	When lit, a critical alarm condition exists and requires your immediate attention.
❷	Warning Alarm LED (yellow)	When lit, a warning alarm condition exists. Failure to correct this condition could cause a critical alarm.
❸	Check Log LED (yellow)	When lit, at least one new event has been logged since the last time the log was checked. Only events that pertain to the operation of the RDU or cooling modules in the group will activate the LED.
❹	Status LED (green)	When lit, the RDU is receiving electrical power. When flashing green, the RDU is downloading firmware for the controller. This may take several minutes.
❺	Liquid Crystal Display (LCD)	View alarms, status data, context-sensitive help, and modify configurable items.
❻	Up and down arrow keys	Select menu items and access information.
❼	ESC key	Return to previous screen or cancel current operation.
❽	Enter key	Open menu items and input changes to cooling group level and cooling unit level settings.
❾	Help key	Display context-sensitive help. Press the help key for information about each option on the screen and for instructions on performing tasks.

Using the Display

Every time you apply power to the cooling unit, the display interface initializes, causing the LEDs to cycle and the alarm-tone to activate.

Scrolling status screens

After start-up, the interface displays the firmware revision number of the display interface. The display interface then scrolls automatically and continuously through screens of status information.

Status Screen Name	Status Information Displayed
System Status	• Alarms Present • IP: xxx.xxx.xxx.xxx • Date/Time
RDU	• On/Standby • RDU ID (Unit identifier) • Name • Loc (RDU location)
CM ID	• CM ID • Cool Out 15 kW • Cool Setpt (Setpoint): 22°C (or 71.9°F) • Rack Inlet: 23°C (or 73.7°F)

Press the up or down arrow key to interrupt the automatic scrolling and view a specific status screen. To return to the scrolling status screens, press ESC from one of the main menu screens.

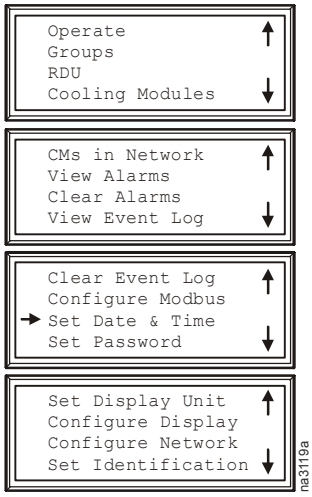
Main menu screens

On any top-level status screen, press the ENTER or ESC key to open the first main menu screen.

Note: Once a period of inactivity (at the keys of the display interface) exceeds the **Password Timeout** setting, the display interface returns to the scrolling status screens.

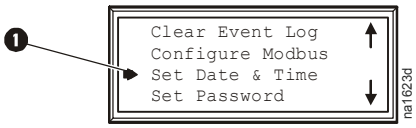
For information on setting the time-out duration, see.“Password and timeout” on page 30

All main menu choices are displayed on a series of main menu screens, as shown.



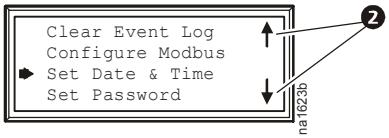
Navigating the screens

Selector arrow. Press the up or down arrow key to move the selector arrow ❶ to a menu option. Press the ENTER key to view the selected sub-menu screen. In the example shown below, the selector arrow points to the **Set Date and Time** setting. To select that item, press the ENTER key.



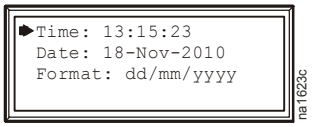
Note: If the selector arrow is on the top line of a main menu screen, press the up arrow key to move the selector arrow to the top line of the previous screen.

Continue arrows. Continue arrows ❷ indicate that additional options or settings are available on a menu or status screen. Press the up or down arrow key to view the additional items.



Sub-menus

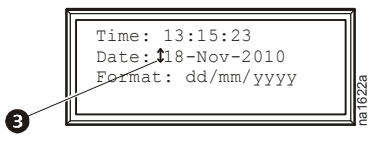
Selecting a main menu option displays the sub-menu screen for that option. In this example, the selector arrow is on the top line of the **Set Date and Time** sub-menu screen.



Use the up or down arrow key to move the selector arrow to an option, and press the ENTER key.

- **List of choices**. If the setting is a list of choices, an input arrow ❸ displays next to the setting. Press the up or down arrow key to select the menu option to change. Then press the ENTER key to exit the input mode and save the setting. Press the ESC key to exit without saving.
- **Numbers or text fields**. If the setting is a number or text field, use the arrow keys to select the value of the first character, and press the ENTER key to move to the next character. Press the ENTER key after the last character is set to exit the input mode and save the setting. Press the ESC key to exit without saving. If an invalid value is entered, the display interface beeps and restores the previous valid value to the field.

Input arrows. Input arrows ❸ next to a selected setting indicate that the setting can be modified by pressing the up or down arrow key. Press the ENTER key to save the change or the ESC key to cancel the change.



Using the Path statement

Select the main- and sub-menu options specified in the path statement to view or configure a setting. The path statement lists the main- and sub-menu items you select to navigate to the item to view or modify. The parts of the path statement are defined below:

Path: Main > Set Password > Change Passwords

Main >Your starting point is the main menu.

Set Password > Scroll to and select this option from the main menu.

Change Passwords > Scroll to and select this option from the sub-menu.

Subsequent options are listed and defined under the path statement.

Password entry

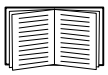
The cooling unit has two levels of password protection:

Device password. Allows Device Users to change basic and environmental settings.

Admin password. Allows all privileges granted for Device Users, and also allows the Administrator to modify settings that control the components in the RDU or CMs in the group or change advanced options.

When you try to change a setting, the display interface prompts you to enter your Admin password. The default value for both the Device and Admin password is **apc** (lowercase). To enter your password, use the up or down arrow key to scroll through the available character set. Press the ENTER key to select the current character and move the cursor to the next character position. After selecting the last character of your password, press the ENTER key once more to submit your password.

Once the password is entered, it remains in effect until the period of inactivity exceeds the **Password Timeout** setting.



See “Password and timeout” on page 1.

Note: Passwords are case-sensitive.

Invalidate NOW. Selecting this option will cause a logout immediately from either Admin or Device and the user must login again with the appropriate password to gain access.

Start the RDU

Path: Main > Operate > Operate

To start the RDU, Select **On**. The pumps will start when the pump starting conditions are met. There must be a refrigerant reserve of at least 20% in the receiver. The Subcooler Outlet Temperature must be less than or equal to 55°F and the Subcooler Outlet Temperature must be at least 0.3°F cooler than the Condensing Temperature.

The RDU will run according to the configured settings.

Note: Operate only affects the local RDU. You must set the **Operate** option for each RDU in the group.

Stop the RDU

Path: Main > Operate > Operate

Select **Standby**. The RDU will enter the standby mode and the CMs associated with the RDU will shut down. This is not an alarm condition.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The **Standby** option does not remove power from the RDU. You must disconnect power at the mains to remove power from the RDU.

Failure to follow these instructions can result in death or serious injury.

Start a CM Remotely

Path: Main > Cooling Modules > Select CM > Operate

To start the CM, select **On**.

Note: The CMs Local On/Off setting must be set to **On** for the CM to operate. Additionally, the CM will not operate until the RDU has started the pump.

Stop a CM Remotely

Path: Main > Cooling Modules > Select CM > Operate

To stop the CM, select **Standby**.

General Configuration

The configuration options are set during the commissioning of the RDU(s) and cooling modules (CMs) in the group.

⚠CAUTION
HAZARD TO EQUIPMENT OR PERSONNEL All work must be performed by American Power Conversion (APC®) by Schnieder Electric authorized personnel. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Note: The Admin Password is required before configuration changes can be entered.

RDU configuration

Path: Main > RDU > Configuration

RDU ID. Enter an identifier number for the RDU.

Start-up Dly. Enter a value for the delay. The start-up delay begins when the unit is started and initialized. The RDU cannot begin operation until this delay expires. Use the start-up delay to restart equipment sequentially after a scheduled downtime or a power outage.

Pump Changeover. The accumulated runtime before the pump is switched over to the lag pump. Enter a value for the **Pump Rotation Time** in Days. If set to zero, the function is disabled.

Stop On Leak. When set to **Yes**, the RDU will stop if a Water Detection Fault activates. Set to **No** to disable the RDU from stopping if a leak is detected.

Note: The leak sensor (APC part number AP9325) is optional.

Note: There are several alarms that will cause the cooling unit to enter **Stop** mode:

- Water Detection Fault (when **Stop On Leak** is set to **Yes**)
- Persistent Receiver Pumped Dry
- Pump 1 Fault (must occur with Pump 2 fault to initiate **Stop** mode.)
- Pump 2 Fault (must occur with Pump 1 fault to initiate **Stop** mode.)
- Persistent Pumps Vapor Locked

See “Alarm messages and suggested actions” on page 1 for more information on alarms.

Power Source. The RDU has two AC inputs. One input is redundant. When Dual Feed is selected, an alarm will initiate if either of the AC inputs fails. If only one feed is used, select Single Feed.

Fluid Temp High Thres. Fluid Temperature High Threshold: configure the entering fluid temperature high threshold. An alarm will initiate when the inlet water temperature exceeds the threshold.

Bypass Mode. Enable/Disable. Select Enable to operate the Bypass Valve.

Reset Options. Run Hours: resets the run hours for the two pumps or the two DC power supplies. **Pump Fault**: clears a pump fault. Pump Fault must be selected to remove a Pump Fault Alarm.

Unassign RDU. Removes the RDU from the group. Any CMs associated to the unassigned RDU will also become unassigned.

RefrigLeak Enable. Enable or disable refrigerant leak detection. When enabled, a Critical alarm will alert you if a loss is detected. A Warning alarm will alert you if leak detection is suspended. Leak monitoring will continue as long as the RDU is ON, the configuration of the system has not changed, and the total system load exceeds 3 kW.

Refrigerant Cal. Calibrates the refrigerant leak detector. The refrigerant leak detector must be calibrated before use. Additionally, the refrigerant leak detector function must be Enabled before it can be calibrated. See “RefLeak” on page 1 for information on Calibration Status settings. The RDU and CMs must be ON with a minimum system load of 5kW. When calibration is complete the leak detector will automatically start leak monitoring.
Calibrate:

- following the addition or removal of CMs.
- anytime refrigerant is added to the system.

Lead Pump. Assigns the lead pump of the two refrigerant pumps in the RDU. When the pump rotation time is reached, the RDU will change the assignment of Lead Pump to the lag pump. See “Pump Changeover” on page 1 to set up pump rotation time.

View and edit the state of input and output contacts:

Input Normal State. Set the normal state of the contact (open or closed). The RDU changes its operating mode to **Standby** when the actual state differs from the normal state.

Output Source. Define the type of output source (alarm), either **Any Alarm** or **Critical**, that causes the output to change from its normal state.

Output Normal State. Set the normal state of the contact (open or closed). If the state of an alarm or event mapped to this contact changes from the normal state, the contact also changes state.

Reboot the Network Management Card.

Path: Main > RDU > Configuration > ResetOptions

Reset NMC. The NMC is rebooted. This is done without interrupting the operation of the pumped refrigerant system. You will be prompted for a confirmation (Yes/No).

CM Configuration

Path: Main > Cooling Modules > Select CM > Configuration > Parameters

Startup Dly. Enter a value for the delay. The startup delay begins when the unit is started and initialized. The CM cannot begin operation until this delay expires. Use the startup delay to restart equipment sequentially after a scheduled downtime or a power outage.

Power Source. The CM has two AC inputs. One input is redundant. When Dual Feed is selected, an alarm will initiate if either of the AC inputs fails. If only one feed is used, select Single Feed.

Disp On Off. Enables/Disables the On/Off control on the local display of the CM.

Stop Cool Fail. If enabled, the unit will shut down if a **Cool Fail** condition is detected. **Cool Fail** is a condition where the difference between the supply air temperature of the CMs and 90°F integrated over time exceeds 300 seconds, given that the difference is positive and the power output of the CMs is less than 4 kW.

Identify the cooling modules

Path: Main > CMs In Network > Unconfigured CMs

To add an unconfigured CM to the group: Physically note on paper the temporary ID number as it appears on the display of the CM once power is applied.

Bring the note with the number back to the RDU and proceed to configure the CM using the temporary ID number to identify the CM from the list that appears on the RDU display interface.

Note: Be careful to add only CMs that are physically piped to the RDU. Do not add CMs that are piped to other RDUs.

Note: Name the CM according to the three digit protocol:

- First digit is the RDU #
- Second digit is the Group #
- Third digit is the CM #

If there are unassigned CMs, the screen will show a list of the CMs by identification number. To assign a CM to the group, select the CM. You must enter the Admin Password to continue to the next screen.

RDU ID. The unique identification number of the RDU. Range: 1 through 4. This value is used to identify the RDU from which CMs will receive refrigerant from the RDU.

Group #. Use the up and down arrow buttons to scroll to the group number you want. Range: 1 through 15. This value is used to identify which CMs are to operate as a group.

CM #. Use the up and down arrow buttons to scroll to the number you want to associate to the CM you are adding. Range: 1 through 15. The value selected uniquely identifies a CM within a set of CMs having the same RDU ID and Group # parameters.

Assign CM. Selecting Assign CM opens the next screen. Select Yes to add the CM to the group.

Pool Empty. If this screen appears when you select **Unconfigured CM**, there are no unassigned CMs.

Group Configuration

Group settings determine which modules are available in each group and how the groups should operate.

⚠ CAUTION
HAZARD TO EQUIPMENT OR PERSONNEL All work must be performed by American Power Conversion (APC®) by Schnieder Electric authorized personnel. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Modify a Cooling Module (CM) ID

Path: Main > Cooling Modules > Select CM > Configuration > Modify CM ID

RDU ID. The unique identification number of the RDU.

Group #. Select a new Group number.

CM #. Select a new CM number.

Assign CM. Select to apply the changes to the selected CM. Once selected, the confirmation screen comes up. Select **Yes** or **No**.

View the groups

Path: Main > Groups

Select Group. Select the group you want to view.

CM List. From the group number you selected, you can view the CMs by ID number.

Number of Units. Select the number of CMs you expect to be in the group. The Group Communications Loss alarm is initiated if the CMs detect less or more CMs than this value.

Unassign CMs

Two menu paths are available to unassign cooling modules.

1. From this menu, select the CM ID to unassign. Press the ENTER key and Select **Yes**.

Path: Main > CMs in Network > All Assigned CMs

2. From this menu, press the ENTER key and select.

Path: Main > Cooling Modules > Select CM > Configuration > Unassign CM

Configure Modbus

Path: Main > Configure Modbus

Modbus. Enable or **Disable** the Modbus communication protocol.

Target Id. Each Modbus device must have a unique target identification number. Enter a unique number from 1 to 247 for the RDU.

Baud Rate. 9600 bps.

Control the Environment

The primary function of the Pumped Refrigerant System is to capture the heat generated by IT equipment and neutralize it before it mixes with the room air.

Controls in the RDU monitor room conditions to ensure the leaving refrigerant temperature to the CMs is always above the room dew point.

In a HACS or RACS environment, the CMs neutralize the heat accumulated in the common hot aisle and expel it into the surrounding environmental space at the desired temperature.

Path: Main > Groups > Select Group > Setpoints

A setpoint is the target value that a cooling group tries to maintain. The default setpoints are appropriate for most cooling applications.

The setpoints for each mode must be within the following ranges:

Cool Stpt. 22.2 °C (66 - 90°F) This setting is only available in InRow mode.

Supply Stpt. 17.8–29.4 °C (64.0–84.9°F)

Note: The **Supply Stpt** setting is defined by APC authorized personnel only when the group is commissioned.

Note: The **Supply Stpt** setting must never be set higher than the **Cool** setpoint.

Fan Speed. When the CM is programmed for HACS or RACS mode and **Air Flow** is set to **Auto**, the **Air Flow** property specifies the desired temperature difference (dT) across the IT equipment.

When the CM is programmed for InRow, HACS or RACS with **Air Flow** set to **Manual**, select the **Fan Speed** from the following options.

- Low: 16.7°C (30°F) DT (60% of maximum fan speed)
- Med-Low: 13.9°C (25°F) DT (70% of maximum fan speed)
- Med: 11.1°C (20°F) DT (80% of maximum fan speed)
- Med-High: 6.3°C (15°F) DT (90% of maximum fan speed)
- High: 5.6°C (10°F) DT (100% of maximum fan speed)

The **Fan Speed** setting is ignored when the CM is set to the InRow mode and **Air Flow** is set to **Auto**.

Air Flow. Manual/Auto (RA only)

Cfg Type. Select the cooling configuration from the following options:

- In-Row: The air flow is not ducted. The hot-aisle air is cooled and the cooled-air supply is shared by all loads in the row.
- RACS (Rack Air Containment System): Air flow in the enclosure is controlled by a ducting system fitted to the enclosure.
- HACS (Hot Aisle Containment System): Air flow in the room is controlled by enclosing the hot air aisle. The loads share an enclosed common hot aisle.

Light On Time. The number of minutes the task lights will remain on after movement is detected. (OA only)

Dsp Units. US/Metric

Measurements

Path: Main > Groups > Select Group > Measurements

View sensor readings from the CMs as a combined average from the display interface of the RDU.

Cool Output. Capacity output in kW.

Avg Sply Air. The combined average supply air temperature of all CMs in the group in °C (°F).

Avg Ret Air. The combined average return air temperature of all the CMs in the group displayed in °C (°F).

Avg Fan. The combined average fan speed of all the CMs in the group displayed in percent of full scale (0 - 100%).

Airflow - Avg CFM. The combined average cubic feet per minute (CFM) of air flow that the CMs are creating.

Total CFM. The combined total CFM of all CMs in the group.

Group PIDs

Path: Main > Groups > Select Group

Set Cool PID. Tune the Rack Inlet Temperature Controller. (InRow mode only)

Reset to Defaults. Resets to the default settings.

The Proportional plus Integral plus Derivative (PID) loop controls the output of the fans.

⚠NOTICE
HAZARD TO EQUIPMENT This procedure is to be performed by APC authorized personnel only. Improperly set PID controls could result in equipment damage. **Failure to follow these instructions can result in equipment damage.**

Gain (P). The proportional multiplier (gain) for this mode or actuator. The proportional multiplier adjusts for the difference (error) between the measured value and the setpoint.

Rate (I). The integral multiplier (reset rate) for this mode or actuator. The integral multiplier adjusts for error measurement and the amount of time that the error has existed. The integral multiplier adds to or subtracts from the output in small increments to correct for the offset error caused by the proportional contribution.

Deriv (D). The derivative multiplier (derivative) for this mode or actuator. The derivative multiplier adjusts the output for rapid changes in the error, correcting for the rate of change of the error.

Tune the PID loop

Tune the PID loop to optimize the performance of the cooling group.

⚠ NOTICE
HAZARD TO EQUIPMENT This procedure is to be performed by APC authorized personnel only. The PID loop must be tuned after the equipment in the room is installed and running. **Failure to follow these instructions can result in equipment damage.**

Note: The PID loop should be tuned periodically to account for changes in the room load.

1. Adjust the integral and derivative constants to zero and the proportional constant to 1.0.
2. Set the temperature setpoint value and start the cooling group.
3. When the temperature reaches a stable value, increase the proportional constant by 0.5. If the temperature does not respond to this change, adjust the setpoint.
4. Repeat step 3 until the temperature value starts to oscillate and the peak amplitude of the oscillations is constant.
5. Note the time, in minutes, between the peaks of the oscillations. This is the Ultimate Period, P_U.
6. Note the value of the proportional constant. This is the Ultimate Gain, G_U.
7. Compute the PID constants using the table below. Use the equations for that control method in the row to compute the values for each constant.

Control Method	Proportional	Integral	Derivative
P	$0.5*G_U$	–	–
P + I	$0.45*G_U$	$0.54*G_U/P_U$	–
P + I + D	$0.6*G_U$	$1.2*G_U/P_U$	$0.075*G_U*P_U$

8. Set each constant according to these calculations.

Further tune the PID loop in the following ways to account for changes in the room load:

Loop Behavior	PID Tuning Correction
Slow response to temperature changes	Increase the proportional multiplier or increase the derivative multiplier.
Overcooling/undercooling after changes in the room load or changes in setpoint	Increase the derivative or the proportional multiplier.
Environmental temperature never reaches the setpoint	Increase the integral multiplier.
Overcooling/undercooling on constant room load	Decrease the integral multiplier.

RDU (component) run hours

The RDU records the number of hours each of its components has operated. When a component is replaced, use the **Reset Run Hours** option to reset the run hours for the displayed component to zero.

Path: Main > RDU > Status > Run Hours

Run Hours. View the run hours for the Refrigerations Pumps (1 and 2) and for the DC Power Supplies (1 and 2).

Reset RDU run hours

Path: Main > RDU > Configuration > Reset Options > Run Hours

Reset Run Hrs. Reset the run hours for the Refrigerations Pumps (1 and 2) and for the DC Power Supplies (1 and 2) when one of these components is replaced.

CM (component) run hours

Path: Main > Cooling Modules > Select CM > Status > Run Hours

Run Hrs. View the run hours for the fans and fan air filters (RA only of the selected CM).

Reset CM run hours

Path: Main > Cooling Modules > Select CM > Configuration > Reset Run Hours

Reset Run Hrs. Reset the run hours for the fans and fan air filters (RA only) of the selected CM after they are replaced.

Thresholds

Set alarms to alert you to threshold violations.

Path: Main > Cooling Modules > Select CM > Configuration > Alarm Threshlds

When the monitored input violates the set temperature threshold of the CM, an alarm will occur. Set thresholds for the following sensors:

Rack Inlet. The temperature of the air entering the rack at the rack inlet sensor.

Supply Air. The average temperature of the air output from the CM, measured by the supply air temperature sensors.

Return Air. The temperature of the air entering the CM at the return temperature sensors.

Service intervals

Path: Main >Cooling Modules > Select CM > Configuration > Service Intervals

The service interval depends on environmental cleanliness. Each component interval setting has an alarm. If enabled, the alarm will sound when the interval has elapsed. The alarm is cleared by selecting **Clear Alarms** in the main menu. Set the number of weeks to service the following:

Air Filter Maintenance Interval. (Only displays for CMs with air filters.) The default is 18 weeks.

Alarm > Select > Enabled/Disabled

Note: The CM **Air Filter** interval alarm is enabled by default.

Display Settings

Set display interface settings, including time and date, units of measure, passwords, and time-out settings. You can also adjust the contrast, key click, beeper volume, and beep on alarm settings.

Password and timeout

Path: Main > Set Password

Note: The default user password is **apc** (lowercase). See “Password entry” on page 1 for more information on how to enter the password.

Change passwords. Set the Admin and Device passwords.

1. Move the selector arrow next to the **Change Passwords** option and press the ENTER key.
2. Select the password to change (either **Admin** or **Device**).
3. Enter a new password (up to 8 characters).
4. Press the ENTER key to confirm.

Timeout. Set the length of time which can elapse when no keys are pressed before the display interface returns to the scrolling screen status. The password must then be entered to regain access.

Invalidate. Override the password timeout and require password entry immediately.

Date and time

Path: Main > Set Date & Time

Set the time. Enter the correct time, and press the ENTER key. The **Time** is displayed on some status screens and is also used in the alarm and event logs to time-stamp events

Set the date. Enter the day, month, and year, and press the ENTER key. The **Date** is displayed on some status screens and is also used in the alarm and event logs to date-stamp events.

Set the format. Use the up or down arrow key to select the date **Format** setting.

- mm/dd/yyyy (11/16/2009) (Default)
- yyyy-mm-dd (2009-11-16)
- dd-mmm-yy (16-Nov-09)
- mmm-dd-yy (Nov-16-09)
- dd.mm.yyyy (16.11.2009)

Identify the RDU by Name and Location

Path: Main > Set Identification

User Defined Name. Use this to identify the unit by giving the unit a name.

User Defined Loc. Use this to identify the unit by its location.

Adjust display

Path: Main Menu > Configure Display

Contrast. Adjust the visibility of the screen text. Lower numbered settings provide darker text; higher numbers provide lighter text. Settings range from 0–7.

Key Click. Enable or disable an audible tone that will sound every time a key is pressed on the display interface.

Beeper Volume. Set the volume of the display interface alarm tone, and for the audible tone that sounds every time a key is pressed on the display interface.

Beep On Alarm. Set the cooling unit to sound an audible tone every 30 seconds when a new alarm occurs. Silence the audible tone by pressing any key on the display interface. When the alarm clears itself, the tone will stop on its own.

Display units

Path: Main Menu > Set Display Units

Set the units of measure for the cooling unit to either **US** or **Metric**.

Network Configuration

The RDU is shipped with a Network Management Card that enables you to manage the RDU and attached CMs over your network. Configure the network settings for the Rack PDU Network Management Card from the display interface. The management card allows remote control and configuration of the equipment.

Configure the network

Path: Main > Configure Network

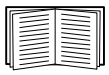
MAC Address. Displays the unique network identifier assigned to the Network Management Card of the RDU at the factory.

IP Address. You will be prompted to enter an Admin password. Enter the password and press ENTER to return to the **IP** screen. Press ENTER again to change the following settings for **Manual** boot mode only.

- **IP:** Enter the IP address assigned to the Network Management Card of the cooling unit.
- **SM:** Enter the subnet mask for the Network Management Card of the cooling unit.
- **GW:** Enter the default gateway for the Network Management Card of the cooling unit.

Boot Mode. Set the method by which the Network Management Card of the RDU will acquire its network settings.

- **Manual:** Enter the IP Address, subnet mask, and default gateway using the **IP Address** menu.
- **BOOTP:** Set the Network Management Card of the unit to obtain its network settings from a BOOTP server.
- **DHCP:** Set the Network Management Card of the unit to obtain its network settings from a DHCP server.

  By default, DHCP requires an APC cookie before it will accept an IP address. See “DHCP” on page 1 for more information.

- **BOOTPDHCP:** Set the Network Management Card of the unit to search for its network settings from either a BOOTP or a DHCP server.

View Status Readings

The display interface has several options for viewing the status of the RDU, the CMs in the cooling group either individually or as a group, and the environment being controlled. The status readings for the cooling unit are available under the **View Unit Status** option in the main menu, and status readings for the cooling group are available under the **View Group Status** option on the main menu or on the scrolling status screens.

Scrolling status screens

When the display interface is idle, it scrolls through screens of status information. Press the up or down arrow key to interrupt the automatic scrolling and view a specific status screen.

- **Alarms Present:** If any alarms are present they will display.
- **IP:** The IP address of the RDU.
- **RDU:** Displays the current operating status of the RDU.
- **RDU ID:** Display the unique ID for this RDU.
- **User Defined Name:** The selected name is displayed.
- **User Defined Location:** The selected location is displayed.
- **CMID:** Cooling Module ID.
- **Cool Out:** Output displayed in kW.
- **Cool Stpt:** Displayed in F or C.
- **Rack Inlet:** Displayed in F or C.

Status

Path: Main > RDU > Status > Overview

View information specific to this RDU.

Op Mode. The RDU is in one of the following modes:

- **On:** The RDU is pumping refrigerant to the CMs at the proper condensing temperature.
- **Standby**: The RDU is receiving power but not enabled for pumping.
- **Stop**: The RDU has stopped due to an unrecoverable condition.

For more information, see “Stop On Leak” on page 1.

Lead Pump. Specifies which refrigerant pump is operating presently, either Pump 1 or Pump 2.

RefLeak. Specifies Calibration Status as: Suspended, Calibrating, Operating, or Disable.

Path: Main > RDU > Status > Active TH Sensors

Displays a list of Temperature Humidity sensors by address, present in the system.

Path: Main > RDU > Status > Measurements

Temperatures. The temperature at each of the sensors in the RDU.

- **Water In:** The temperature of the chilled water entering the RDU.
- **Water Out:** The temperature of the chilled water leaving the RDU.
- **Condenser:** The temperature of the refrigerant leaving the condenser.
- **Dew Point:** The temperature at which condensation will occur in the conditioned environment.
- **Pump Outlet:** The temperature of the refrigerant leaving the pump.
- **SubCool Out:** The temperature of the refrigerant leaving the sub-cooler (heat exchanger).
- **Cond Outlet:** The temperature of refrigerant leaving the heat exchanger.
- **Cond Inlet:** The temperature of refrigerant entering the heat exchanger.

Pressures. The pressure sensor readings.

- **Cond Out:** The pressure of refrigerant leaving the heat exchanger.
- **Pump 1 Head:** The difference between the outlet pressure and the inlet pressure of Pump 1.
- **Pump 2 Head:** The difference between the outlet pressure and the inlet pressure of Pump 2.

Speed and Volume. The sensor readings displayed as RPMs or percentage of total capacity.

- **Pump 1:** The speed of Pump 1 as a percentage of the total capacity.
- **Pump 2:** The speed of Pump 2 as a percentage of the total capacity.
- **CW VLV:** The volume of chilled water passing through the valve, expressed in percentage of total capacity.
- **BypassVlv Pos:** The volume of chilled water passing through the bypass valve, expressed in the percentage of the total capacity.

Power. View power usage expressed in Amps.

- **DC Supply 1:** The amount of current used by DC power supply 1.
- **DC Supply 2:** The amount of current used by DC power supply 2.
- **Total DC PS:** The amount of current used by both DC power supplies.

Contacts. View the state of input and output contacts.

- **Input State:** Open or Closed
- **Output State:** Open or Closed

Path: Main > Cooling Modules > Select CM > Status > Overview

Temperature. The temperature at each of the sensors in the selected CM.

- **Rack Inlet:** The temperature of the air entering the rack at the remote temperature sensor.
- **Supply Air:** The average temperature of the air entering the CM as measured by the supply air temperature sensors.
- **Return Air:** The average temperature of the air leaving the CM as measured by the return air temperature sensors.
- **Liquid In:** The temperature of the pumped refrigerant entering the CM as measured by the liquid refrigerant temperature sensor.
- **Vapor Out:** The temperature of the pumped refrigerant leaving the CM as measured by the vapor refrigerant temperature sensor.
- **Evaporator:** The evaporation temperature of the refrigerant as it leaves the evaporator.

Pressures. The pressure sensor readings:

- **Liquid In:** The pressure of the pumped refrigerant entering the CM as measured by the liquid refrigerant pressure transducer.
- **Vapor Out:** The pressure of the pumped refrigerant leaving the CM as measured by the vapor refrigerant pressure transducer.

Valve Positions. The positions of the EEV and EPRV as expressed in a percentage of a full open condition.

- **EEV Pos:** The current position of the Electronic Expansion Valve.
- **EPRV Pos:** The current position of the Electronic Pressure Regulator Valve.

Cooling group status

Path: Main > View Group Status

View information about the group.

Max Rack. The highest rack temperature reported by any sensor.

Min Rack. The lowest rack temperature reported by any sensor.

Air Flow. The combined airflow output of the modules in the group.

Cool Output. The combined output of the group.

Cool Demand. The cooling output required to meet the current heat load of the conditioned space.

Cool Setpt. The temperature you set to maintain the room environment.

About the RDU

Path: Main > RDU > About

View identifying information that is helpful when obtaining service:

- **RDU ID**: Identifier of the RDU
- **S/N**: Serial number
- **F/W**: Controller firmware revision
- **H/W**: Hardware revision
- **RDU APP**: Application firmware version
- **AOS Ver**: APC OS firmware version

Event Log

The event log saves status information and a message each time a change in the group is detected. Alarms and events are recorded in the log and displayed on the active alarms screen. Status events (informational) and system configuration changes are only displayed in the event log.

View event log

Path: Main > View Event Log

The event log keeps a record of all alarms and events. The screen displays the following:

- The name of the event.
- The time and date the event occurred.

Use the arrow keys to scroll through the list of events and display the date and time for each event.

Clear event log

Path: Main > Clear Event Log

A confirmation screen is displayed when you select this option. Enter the Admin password to erase the log. Select **YES** to erase all of the events in the log. Select **NO** to return to the main screen.

Respond to Alarms

When an alarm is triggered, the unit alerts you through the display by the following methods:

- Active alarm screen entry on scrolling status screens
- LEDs on the front panel display
- An optional audible alarm every 30 seconds, if enabled

View active alarms

Path: Main > View Alarms

The **View Alarms** screen provides the number of alarms, the severity, and a brief description of the alarm. Press the arrow keys to view the rest of the list.

Clear active alarms

Path: Main > Clear Alarms

A confirmation screen is displayed when you select this option. Enter the Admin password to clear the alarm list. Select **YES** to clear all of the alarms in the list. Select **NO** to return to the main screen. If the conditions that caused the alarm still exist, those conditions cause the alarm to be regenerated.

Alarm messages and suggested actions

Alarm Message	Severity	Action Required
Bypass Valve Actuator Fault	Warning	• Verify the actuator is connected properly. • Tighten the linkage screw on the actuator shaft. • Confirm that the rotary switch is pointing toward the top of the cooling unit when the valve in the fully closed position. • For assistance, contact Technical Support.
CM Communication Fault	Critical	• Verify that the power is ON to the Cooling Module. • Contact Technical Support.
Condenser Inlet Temperature Sensor Fault	Warning	• Make sure the temperature sensor entering the heat exchanger is connected and placed properly. • Make sure the **Condenser Inlet** temperature threshold is set correctly in the **Sensor Measurements** screen. • If the problem persists, contact Technical Support.
Condenser Outlet Pressure Sensor Fault	Critical	• Make sure the pressure sensor leaving the heat exchanger is connected and placed properly. • If the problem persists, contact Technical Support.
Condenser Outlet Temperature Sensor Fault	Critical	• Make sure the temperature sensor leaving the heat exchanger is connected and placed properly. • If the problem persists, contact Technical Support.
Condensing Temperature High Violation	Warning	• Verify that the chilled water temperature and flow is within specifications. • If the problem persists, contact Technical Support.
Condensing Temperature Low Violation	Warning	• Verify that the chilled water temperature and flow is within specifications. • If the problem persists, contact Technical Support.
CW Valve Actuator Fault	Critical	• Verify the actuator is connected properly. • Tighten the linkage screw on the actuator shaft. • Confirm that the rotary switch is pointing toward the top of the cooling unit when the valve is in the fully closed position. • For assistance, contact Technical Support.
DC Power Supply 1 Fault	Critical	• Contact Technical Support.
DC Power Supply 2 Fault	Critical	• Contact Technical Support.
Discrete Input Abnormal	Warning	• Contact Technical Support.
Entering Fluid Temperature High Violation	Warning	• Verify that the temperature sensor is properly installed. • Make sure the chiller is operating properly. • If the problem persists, contact Technical Support.
Inlet Water Temperature Sensor Fault	Warning	• Make sure the temperature sensor is connected and placed properly. • If the problem persists, contact Technical Support.
Low Refrigerant Level	Warning	• Add necessary amount of refrigerant to maintain the minimum refrigerant level in the receiver.
No Redundant Pump	Warning	• There are other Pump Faults that must be resolved. • If the problem persists, contact Technical Support.
No Temperature/Humidity Sensors Available	Critical	• Make sure the sensors are connected and configured properly. • Make sure the CAN terminators are installed • Contact Technical Support.
Outlet Water Temperature Sensor Fault	Warning	• Make sure the sensor is connected properly. • Make sure the **Water Out** temperature threshold is set correctly in the **Sensor Measurements** screen. • If the problem persists, contact Technical Support.
Persistent Pumps Vapor Locked	Critical	• Contact Technical Support

Alarm Message	Severity	Action Required
Persistent Receiver Pumped Dry	Critical	• Verify that there is adequate refrigerant in the system. • Verify that the Cooling Modules are functioning properly. • If the problem persists, contact Technical Support.
Primary Power Source Failure	Warning	• Ensure that the power source is connected properly and within specifications. • If the problem persists, contact Technical Support.
Secondary Power Source Failure	Warning	• Ensure that the power source is connected properly and within specifications. • If the problem persists, contact Technical Support.
Pump 1 Discharge Pressure Sensor Fault	Critical	• Make sure the pressure sensor is connected properly. • If the problem persists, contact Technical Support.
Pump 1 Fault	Warning	• Contact Technical Support.
Pump 1 High Head Pressure	Warning	• Contact Technical Support.
Pump 2 Discharge Pressure Sensor Fault	Critical	• Make sure the pressure sensor is connected properly. • If the problem persists, contact Technical Support.
Pump 2 Fault	Warning	• Contact Technical Support.
Pump 2 High Head Pressure	Warning	• Contact Technical Support.
Pumps Vapor Locked	Warning	• Contact Technical Support.
Pump Outlet Temperature Sensor Fault	Warning	• Make sure the temperature sensor is connected properly. • If the problem persists, contact Technical Support.
RDU Communication Fault	Critical	• Contact Technical Support.
Receiver Pumped Dry	Warning	• Verify that there is adequate refrigerant in the system. Add refrigerant if necessary. • If the problem persists, contact Technical Support.
Refrigerant Loss Detected	Critical	• A refrigerant leak has been detected. • Identify the source of the leak. • Have the leak repaired and the refrigerant replaced. • For assistance, contact Technical Support.
Refrigerant Loss Detection Disabled	Warning	• At least one of the following conditions has occurred: - Refrigerant was added to the system - One or more CMs have been added or removed from the system. - One or more CMs have been placed into Standby, Stop or Maint mode. • If the change is permanent, the refrigerant leak detector must be recalibrated. • For assistance, contact Technical Support.
Starting Conditions Not Satisfied	Warning	• Ensure the chilled water temperature is within specifications. • If the problem persists, contact Technical Support.
System Stop	Critical	• Check for other alarms (Water Leak Detected, Persistent Receiver Pumped Dry, Pump Fault, Pumps Vapor Locked). • If the problem persists, contact Technical Support.
Subcooler Outlet Temperature Sensor Fault	Warning	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
Temperature/Humidity Sensor Duplicate CAN Address	Warning	• Inspect the DIP switches on the temperature/humidity sensors and ensure that all the settings are unique.
Temperature/Humidity Sensor N Added	Informational	• Notification that the addition of the new sensor has been recognized by the RDU.
Temperature/Humidity Sensor N Removed	Informational	• Notification that the removal of the sensor has been recognized by the RDU.

Alarm Message	Severity	Action Required
Unit is in Maintenance Mode	Critical	• Service Technician may be troubleshooting the unit. To return the unit to normal operation, reset the unit.
Water Leak Detected	Critical	• Identify and isolate the source of the leak. • For assistance, contact Technical Support.
Water Leak Detected Warning	Warning	• Identify and isolate the source of the leak. • For assistance, contact Technical Support.

CM alarm messages

Alarm Number	Alarm Message	Severity	Action Required
28	**Air Filter Service Interval Expired** (RA only)	Warning	• Clean or replace the air filter • Reset the alarm.
29	**Evaporative Temperature Below Dewpoint**	Critical	• Contact Technical Support.
22	**Fan 1 Door Open** (OA only)	Critical	• Make sure the door is closed. • Make sure the door interlock switch is connected properly.
17	**Fan 1 Fault**	Warning	• Make sure the fan door is fully closed. • Make sure all intakes are clear of blockage. • Make sure the fan housing is full installed in the locked position. • If the problem persists, contact Technical Support.
24	**Fan 1 Missing or Wrong Type** (OA only)	Critical	• Make sure the fan housing is fully installed and in the locked position. • Make sure the fan is set to the correct voltage. • If the problem persists, contact Technical Support.
23	**Fan 2 Door Open** (OA only)	Critical	• Make sure the door is closed. • Make sure the door interlock switch is connected properly.
18	**Fan 2 Fault**	Warning	• Make sure the fan door is fully closed. • Make sure all intakes are clear of blockage. • Make sure the fan housing is full installed in the locked position. • If the problem persists, contact Technical Support.
25	**Fan 2 Missing or Wrong Type** (OA only)	Critical	• Make sure the fan housing is fully installed and in the locked position. • Make sure the fan is set to the correct voltage. • If the problem persists, contact Technical Support.
19	**Fan 3 Fault** (RA Only)	Warning	• Make sure all intakes are clear of blockage. • Make sure the fan housing is full installed in the locked position. • If the problem persists, contact Technical Support.
20	**Fan 4 Fault** (RA Only)	Warning	• Make sure all intakes are clear of blockage. • Make sure the fan housing is full installed in the locked position. • If the problem persists, contact Technical Support.
21	**Fan 5 Fault** (RA Only)	Warning	• Make sure all intakes are clear of blockage. • Make sure the fan housing is full installed in the locked position. • If the problem persists, contact Technical Support.
27	**Fan Type Not Configured**	Critical	• Contact Technical Support.
13	**Group Communication Fault**	Warning	• Confirm that the A-Link cables are connected properly to the A-Link ports. • Confirm that the A-Link network has terminators on the first and the last units in the chain. • Verify the number of cooling units in the group is correct. • If the problem persists, contact Technical Support.
8	**Liquid Inlet Pressure Sensor Fault**	Critical	• Make sure the refrigerant supply pressure sensor is connected properly. • If the problem persists, contact Technical Support.
5	**Liquid Temperature Sensor Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
15	**Primary Power Source Failure**	Warning	• Make sure the power source is connected properly and is within specifications.

Alarm Number	Alarm Message	Severity	Action Required
31	**Primary Power Source Overvoltage**	Critical	• The input voltage is higher than the unit's rated value. Connect the unit to a properly rated voltage input.
16	**Secondary Power Source Failure**	Warning	• Make sure the power source is connected properly and is within specifications.
32	**Secondary Power Source Overvoltage**	Critical	• The input voltage is higher than the unit's rated value. Connect the unit to a properly rated voltage input.
7	**Rack Temperature Sensor Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
10	**Rack Temperature High Violation**	Critical	• Make sure the temperature sensor is connected properly. • Make sure the **Rack Inlet High Temperature** threshold is set correctly in the **Thresholds** screen. • If the problem persists, contact Technical Support.
30	**RDU Communications Fault**	Critical	• Confirm that the A-Link network has terminators on the first and the last units in the chain. • Confirm that the A-Link cables are connected properly to the A-Link ports. • If the problem persists, contact Technical Support.
11	**Return Air High Temperature Violation**	Warning	• Make sure the sensor is connected properly. • Make sure the **Return Air High Temperature** threshold is set correctly in the **Thresholds** screen. • If the problem persists, contact Technical Support.
0	**Return Air Temperature Sensor Fault** (Front - OA, Top - RA)	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
1	**Return Air Temperature Sensor Fault** (Middle)	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
2	**Return Air Temperature Sensor Fault** (Rear - OA, Bottom - RA)	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
12	**Supply Air High Temperature Violation**	Warning	• Make sure the sensor is connected properly. • Make sure the **Supply Air High Temperature** threshold is set correctly in the **Thresholds** screen. • If the problem persists, contact Technical Support.
3	**Supply Air Temperature Sensor Fault (Front)** OA only	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
4	**Supply Air Temperature Sensor Fault (Rear)** OA only	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
33	**Unit in Maintenance Mode**	Critical	• Service Technician may be troubleshooting the unit. To return the unit to normal operation, reset the unit.
35	**Upper Supply Temperature 1 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
36	**Upper Supply Temperature 2 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
37	**Upper Supply Temperature 3 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
38	**Upper Supply Temperature 4 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.

Alarm Number	Alarm Message	Severity	Action Required
39	**Lower Supply Temperature 1 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
40	**Lower Supply Temperature 2 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
41	**Lower Supply Temperature 3 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
42	**Lower Supply Temperature 4 Fault**	Critical	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.
14	**Unit ID Needs Configuration**	Critical	• Configure the unit through the display interface.
26	**Unit Personality Not Configured**	Critical	• Contact Technical Support.
9	**Vapor Outlet Pressure Sensor Failure**	Critical	• Make sure the refrigerant HXGR pressure sensor is connected properly. • If the problem persists, contact Technical Support.
6	**Vapor Temperature Sensor Fault**	Warning	• Make sure the sensor is connected properly. • If the problem persists, contact Technical Support.

Network Management Card

Quick Configuration

Overview

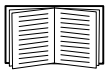
Note: Disregard the procedures described in this chapter if you have APC InfraStruxure® Central as part of your system. See the documentation for your device for more information.

You must configure the following TCP/IP settings before the RDU can operate on a network:

- IP address of the RDU
- Subnet mask
- Default gateway

Note: If a default gateway is unavailable, use the IP address of a computer that is located on the same subnet as the RDU and that is usually running. The RDU uses the default gateway to test the network when traffic is very light.

Note: Do not use the loopback address (127.0.0.1) as the default gateway address for the RDU. It disables the card and requires you to reset the TCP/IP settings to their defaults using a local serial login.



See “Watchdog Features” in the “Introduction” of the Rack PDU *User’s Guide* for more information about the watchdog role of the default gateway.

TCP/IP configuration methods

Use one of the following methods to define the TCP/IP settings needed by the RDU:

- APC Device IP Configuration Wizard (See “APC Device IP Configuration Wizard” on page 1.)
- BOOTP or DHCP server (See “BOOTP and DHCP configuration” on page 1.)
- Networked computer (See “Local access to the command line interface” on page 1 or “Remote access to the command line interface” on page 1.)

APC Device IP Configuration Wizard

You can use the APC Device IP Configuration Wizard at a computer running Microsoft® Windows® 2000, Windows Server® 2003, or Windows XP to discover unconfigured RDUs and configure their basic TCP/IP settings, one card at a time, over the network.

Note: Most software firewalls must be temporarily disabled for the Wizard to discover unconfigured RDUs.

1. If autorun is enabled, the user interface of the CD starts when you insert the *Utility* CD into a computer on your network. Otherwise, open the file **contents.htm** on the CD.
2. Select the Device IP Configuration Wizard from the main menu.
3. When the Wizard discovers the unconfigured RDU, follow the on-screen instructions.

Note: If you leave the option **Start a Web browser when finished** enabled, you can access the RDU through your browser by using **apc** (the default) for both the user name and password.

.ini file utility

You can use the .ini file export utility to export .ini file settings from configured RDUs to one or more unconfigured RDUs. The utility and documentation are included on the *Utility* CD.

BOOTP and DHCP configuration

The default TCP/IP configuration setting, **BOOTP & DHCP**, assumes that a properly configured BOOTP or DHCP server is available to provide TCP/IP settings to RDUs. The RDU first attempts to discover a properly configured BOOTP server, and then a DHCP server. It repeats this pattern until it discovers a BOOTP or DHCP server.

A user configuration (.ini) file can function as a BOOTP or DHCP boot file. For more information, see the TCP/IP configuration section of the *InRow RD User's Guide*, available from the *Utility* CD or the APC Web site, **www.apc.com**.

If neither of these servers is available, see "APC Device IP Configuration Wizard" on page 1, "Local access to the command line interface" on page 1, or "Remote access to the command line interface" on page 1 to configure the needed TCP/IP settings.

BOOTP. For the Rack PDU to use a BOOTP server to configure its TCP/IP settings, it must find a properly configured RFC951-compliant BOOTP server.

In the BOOTPTAB file of the BOOTP server, enter the RDU's MAC address, IP address, subnet mask, and default gateway, and, optionally, a bootup file name. Look for the MAC address on the bottom of the RDU or on the Quality Assurance slip included in the package.

When the RDU reboots, the BOOTP server provides it with the TCP/IP settings.

- If you specified a bootup file name, the RDU attempts to transfer that file from the BOOTP server using TFTP or FTP. The RDU assumes all settings specified in the bootup file.
- If you did not specify a bootup file name, you can configure the other settings of the RDU remotely through its Web interface or command line interface; the user name and password are both **apc**, by default.

To create a bootup file, see your BOOTP server documentation.

DHCP. You can use an RFC2131/RFC2132-compliant DHCP server to configure the TCP/IP settings for the RDU.

This section summarizes the RDU's communication with a DHCP server. For more detail about how a DHCP server can configure the network settings for a RDU, see "DHCP Configuration" in the RDU *User's Guide* on the *Utility* CD.

1. The RDU sends out a DHCP request that uses the following to identify itself:
   - A Vendor Class Identifier (APC by default)
   - A Client Identifier (by default, the MAC address of the RDU)
   - A User Class Identifier (by default, the identification of the application firmware installed on the RDU)
2. A properly configured DHCP server responds with a DHCP offer that includes all the settings that the RDU needs for network communication. The DHCP offer also includes the Vendor Specific Information option (DHCP option 43). By default, the RDU ignores DHCP offers that do not encapsulate the APC cookie in DHCP option 43 using the following hexadecimal format:

   ```
   Option 43 = 01 04 31 41 50 43
   ```

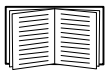
   where:
   - the first byte (`01`) is the code
   - the second byte (`04`) is the length
   - the remaining bytes (`31 41 50 43`) are the APC cookie.

See your DHCP server documentation to add code to the Vendor Specific Information option.

Note: To disable the requirement that a DHCP offer include the APC cookie, clear the check box **Require vendor specific cookie to accept DHCP Address** in the Web interface: **Administration > Network**>**TCP/IP**>**DHCP**. Alternately, at the command line interface, use this command to disable the DHCP cookie requirement: **`boot -c disable`**

Local access to the command line interface. You can use a computer connected to the serial port on the front of the RDU to access the command line interface.

1. Select a serial port at the local computer, and disable any service that uses that port.
2. Use the provided serial cable (APC part number 940-0299) to connect the selected port to the serial port on the front panel of the InRow RD.
3. Run a terminal program (such as HyperTerminal) and configure the selected port for 9600 bps, 8 data bits, no parity, 1 stop bit, and no flow control. Save the changes.
4. Press ENTER, repeatedly if necessary, to display the **User Name** prompt.
5. Use **apc** for the user name and password.



See "Command line interface" on page 1 to finish the configuration.

Remote access to the command line interface

From any computer on the same network as the RDU, you can use ARP and Ping to assign an IP address to the RDU, and then use Telnet to access its command line interface and configure the other TCP/IP settings.

Note: After the RDU has its IP address configured, you can use Telnet, without first using ARP and Ping, to access that RDU.

1. Use the MAC address of the RDU in the ARP command to define the IP address.

   Note: Look for the MAC address on the back of the Network Management Card or on the Quality Assurance slip included in the package (with the replacement Network Management Card).

   For example, to define 156.205.14.141 as the IP address of a RDU with 00 c0 b7 63 9f 67 as its MAC address, use one of the following commands:

   – Windows command format:

   ```
   arp -s 156.205.14.141 00-c0-b7-63-9f-67
   ```

   – LINUX command format:

   ```
   arp -s 156.205.14.141 00:c0:b7:63:9f:67
   ```

2. Use Ping with a size of 113 bytes to assign the IP address defined by the ARP command. For the IP address defined in step 1, use one of the following commands:

   – Windows command format:

   ```
   ping 156.205.14.141 -l 113
   ```

   – LINUX command format:

   ```
   ping 156.205.14.141 -s 113
   ```

3. Use Telnet to access the RDU at its newly assigned IP address. For example:

   ```
   telnet 156.205.14.141
   ```

4. Use **apc** for both user name and password.

See “Command line interface” on page 1 to finish the configuration.

Command line interface

After you log on at the command line interface, as described in “Local access to the command line interface” on page 1 or “Remote access to the command line interface” on page 1, you can manually configure network settings.

1. Contact your network administrator to obtain the IP address, subnet mask, and default gateway for the RDU.
2. Use these three commands to configure network settings. (Text in italics indicates a variable.)

   a. `tcpip -i` *`yourIPaddress`*

   b. `tcpip -s` *`yourSubnetMask`*

   c. `tcpip -g` *`yourDefaultGateway`*

   For each variable, type a numeric value that has the format *`xxx.xxx.xxx.xxx`*.

   For example, to set a system IP address of 156.205.14.141, type the following command and press ENTER:
   `tcpip -i 156.205.14.141`

3. Type `exit`. The RDU restarts to apply the changes.

How to Recover from a Lost Password

You can use a local computer that connects to the RDU through the serial port to access the command line interface.

1. Select a serial port at the local computer, and disable any service that uses that port.
2. The APC serial cable (not provided) is used to connect the console port at the RDU and to your computer. (This cable is available to order from APC.)
3. Run a terminal program (such as HyperTerminal®) and configure the selected port for 9600 bps, 8 data bits, no parity, 1 stop bit, and no flow control.
4. Press ENTER, repeatedly if necessary, to display the **User Name** prompt. If you are unable to display the **User Name** prompt, verify the following:
   - The serial port is not in use by another application.
   - The terminal settings are correct as specified in step 3.
   - The correct cable is being used as specified in step 2.
5. Press the **Reset** button. The Status LED will flash alternately orange and green. Press the **Reset** button a second time immediately while the LED is flashing to reset the user name and password to their defaults temporarily.

   Note: Pressing the **Reset** button will reboot the controller, causing a temporary loss of cooling.
6. Press ENTER, repeatedly if necessary, to display the **User Name** prompt again, then use the default, **apc,** for the user name and password. (If you take longer than 30 seconds to log on after the **User Name** prompt is redisplayed, you must repeat step 5 and log on again.)
7. At the command line interface, use the following commands to change the **User Name** and **Password** settings, both of which are now **apc**:

   `user -an` *yourAdministratorName*

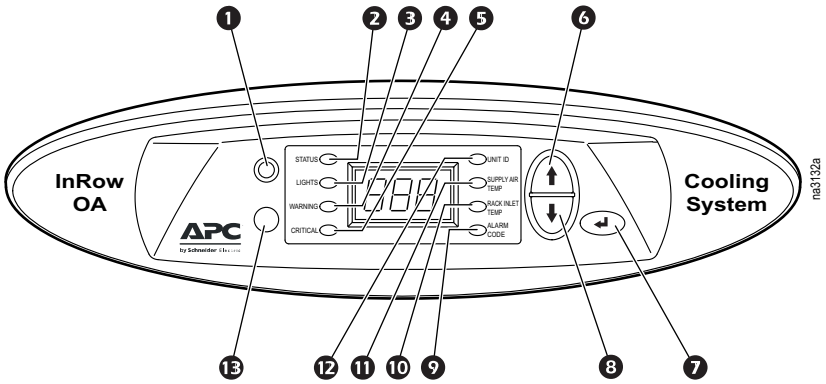
   `user -ap` *yourAdministratorPassword*

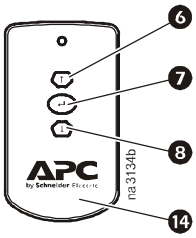
   For example, to change the Administrator user name to **Admin**, type:

   `user -an Admin`
8. Type `quit` or `exit` to log off, reconnect any serial cable you disconnected, and restart any service you disabled.

CM Display

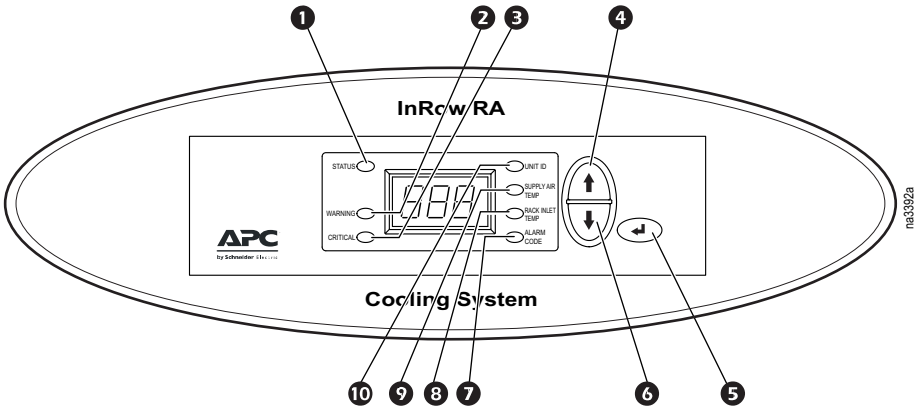
OA display





Item	Description
❶	Infrared remote control receiver
❷	Status LED
❸	Lights LED
❹	Warning LED
❺	Critical alarm LED
❻	Menu selection scroll up key
❼	Enter key
❽	Menu selection scroll down key
❾	Alarm code LED
❿	Rack inlet temperature LED
⓫	Supply air temperature LED
⓬	Unit ID LED
⓭	Motion sensor for lights
⓮	Infrared remote control

RA display



Item	Description
❶	Status LED
❷	Warning LED
❸	Critical alarm LED
❹	Menu selection scroll up key
❺	Enter key
❻	Menu selection scroll down key
❼	Alarm code LED
❽	Rack inlet temperature LED

Display Operation

The display scrolls automatically through the sensor readings and alarms from the items listed to the right side of the display screen. To view information from the items listed to the left of the display screen, press the ENTER key and use the up or down keys to move through the display.

All CMs have a three digit LED display. The capability of the display is limited to relaying sensor readings, the identification number of the CM, and alarms by number only.

Alarm levels are indicated by the LEDs. See the display interface on the RDU for alarm descriptions or for interactive ability.

The RDU comes with an infrared remote control which is used to operate the OAs. The remote has a menu selection scroll up, scroll down, and enter key.

OAs (only) have a motion sensor to activate the lights.

Cooling Modules are powered on or off from the individual CM, not from the RDU.

Cooling On/Off. press the ENTER key on the display interface. The Status LED will illuminate. The display interface will read **On**. Press the Enter key once more to turn cooling to **Standby**.

Disable On/Off lights. OA only. Press the ENTER key on the display interface. Press the Menu selection Scroll Down key once. The Lights LED will illuminate. The display interface screen will read **On**. Press the Enter key once more to turn the lights **Off**. The lights on that OA will remain off until the value is set to **On**.

Warning LED. A Yellow LED will illuminate when Warning level alarms are initiated.

Critical LED. A Red LED will illuminate when Critical level alarms are initiated.

Note: 60 seconds following access of the features located from the left side of the display screen (as facing the display) will elapse before the display will revert to scrolling through the features located to the right of the display screen.

Unit ID. The Unit ID is the identifier given to the CM after it is installed in the system. The RDU uses the unique number to identify and control the CM.

Supply Air Temp. The supply air temperature sensor reading. Centigrade or Fahrenheit display is selected at the RDU.

Rack Inlet Air Temp. Rack inlet air temperature sensor reading. Centigrade or Fahrenheit display is selected at the RDU.

Alarm Code. The Alarm Code number corresponds to the alarm codes listed in “CM alarm messages” on page 1. Refer to the list to identify the alarm.

Maintenance

Leak Detector

Calibration

The leak detection feature must be calibrated before it can be used.

Note: In order for calibration to successfully complete, the RDU and CMs must be on with a minimum system load of 5 kW.

Path: Main > RDU > Status > Measurements

From the display interface, or BMS, start calibration from the above path.

Choose **Calibrating** to initiate the feature.

When Calibration is complete, the leak detector will automatically start leak monitoring.

Leak monitoring will continue as long as the RDU is on, the configuration of the system has not changed, and the total system load exceeds 3 kW.

Note: Leak detection is **Suspended** and a **Warning** alarm will come on when:

1. Refrigerant is added to the system
2. CMs are added or removed from the system
3. CMs are placed into Standby, Evacuation, Stop, or Maintenance modes

Monthly Preventive Maintenance

Photocopy the following pages and use them during the maintenance procedures. After they have been completed, save them for future reference.

Prepared By: _____

Model Number: _____

Serial Number: _____

Date: _____

Environment

q In what type of room is the equipment located?

_____

q Is the equipment maintaining the temperature setpoint?

_____

Temperature setpoint _____

q Is there visible damage to the equipment (dents, scratches)?

_____

_____

_____

q Check for environmental damage (dirt, dust, debris, liquid stains) around the installation area.

_____

_____

q Record the room temperature near the returns of the cooling modules.

Temperature _____

q Record the alarm history for the last month.

_____

_____

_____

Cleanliness

q Check the condition of the area around the unit. Clean if necessary.

q Check for accumulation of debris. Clean as required.

Mechanical

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on the equipment. All electrical work should be performed by licensed electricians. Practice lockout/tagout procedures. Do not wear jewelry when working with electrical equipment.

Failure to follow these instructions can result in death or serious injury.

q Which refrigerant pump is operating? _____

- Pump 1 run hours: _____
- Pump 2 run hours: _____

q Record the refrigerant pump operating information.

- Pressure: _____
- Speed: _____

q Record the inlet and outlet temperatures for the heat exchanger.

- Inlet temperature: _____
- Outlet temperature: _____

Electrical

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on the equipment. All electrical work should be performed by licensed electricians. Practice lockout/tagout procedures. Do not wear jewelry when working with electrical equipment.

Failure to follow these instructions can result in death or serious injury.

q Inspect the electrical panel for tight connections and for overheated connections from loose contact terminals.

q Confirm the incoming main voltage matches the equipment nameplate. The measurement should be within 10% of the nameplate listing.

Quarterly Preventive Maintenance

* Perform all the Monthly Preventive Maintenance items **and** the items below.

Prepared By: _____

Model Number: _____

Serial Number: _____

Date: _____

Mechanical

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on the equipment. All electrical work should be performed by licensed electricians. Practice lockout/tagout procedures. Do not wear jewelry when working with electrical equipment.

Failure to follow these instructions can result in death or serious injury.

q Clean the dust from door perforations.

Functional tests

q Verify the cooling operation mode is functioning properly.

Semi-Annual Preventive Maintenance

* Perform all the Monthly/Quarterly Preventive Maintenance items **and** the items below.

Prepared By: _____

Model Number: _____

Serial Number: _____

Date: _____

Cleanliness

q Check the cleanliness of the unit. Clean if required.

Troubleshooting

Problem	Possible Cause	Corrective Action
Display interface not operational, but equipment operates	• Display interface not connected properly	• Verify that the display interface cable is connected properly.
Alarms do not show up on monitoring equipment (Customer Output Contact)	• External monitoring equipment is not receiving power or is not functioning properly	• Confirm that power, if required, is being supplied to the external equipment. • If the RDU is providing power to the external equipment, verify that the external equipment is ≤50 mA. • Test the external equipment by bypassing the customer output contact.
Equipment does not shut down on command	• Drive voltage	• Verify that there is a drive voltage entering the input of the RDU. You may use the +12 V or +24 V. You must also use the ground.
No communication with building management system (BMS) port	• Improper connection	• Confirm that the RDU is connected to the BMS port and not to the Control port. • Make sure that the wire polarity is correct. Using a DC voltmeter, test the signal with no transmissions in progress. Expect the voltage at pin 2 to be greater than at pin 1 by at least 200 mV. Measure the RDU with the cable disconnected, and then measure it again with the cable connected. If the signal is less than 200 mV, the RDU may be reverse-wired. • Make sure every CM has either two sets of wires on the connector or one set of wires and a terminating resistor of 100 to 120 ohms.
Cooling modules are not communicating with the RDU	• A-Link failure	• Verify that the first and last cooling modules have one cable and a terminator. • Verify that every other cooling module has two cables. • Confirm that the A-Link cables are connected to the A-Link ports and that a network cable is connected to the network port. • Verify that the number of cooling modules in the cooling group matches the group number setting.
Equipment does not shut down on command	• Drive voltage	• Verify that there is a drive voltage entering the input of the cooling unit. You may use the available +12 V or +24 V. You must also use the ground.
No communication with building management system (BMS) port	• Improper connection	• Confirm that the RDU is connected to the BMS port and not to the Control port. • Make sure that the wire polarity is correct. Using a DC voltmeter, test the signal with no transmissions in progress. Expect the voltage at pin 2 to be greater than at pin 1 by at least 200 mV. Measure the RDU with the cable disconnected, and then measure it again with the cable connected. If the signal is less than 200 mV, the RDU may be reverse-wired. • Make sure that every CM has either two sets of wires on the connector or one set of wires and a terminating resistor of 100 to 120 ohms.
CMs are not communicating with each other	• A-Link failure	• Verify that the first and last CMs have one cable and a terminator. • Verify that every other cooling module has two cables. • Confirm that the A-Link cables are connected to the A-Link ports and that a network cable is connected to the network port. • Verify that the number of CMs in the cooling group matches the group number setting.
Output air is 17° C (62° F) and CM fans are running at a very high rate of speed.	• Upper or lower supply air sensor	• Either the upper or lower supply air temperature sensor has a fault. Verify that both supply air temperature sensors are installed and working properly.

APC Worldwide Customer Support

Customer support for this or any other APC product is available at no charge in any of the following ways:

- Visit the APC Web site to access documents in the APC Knowledge Base and to submit customer support requests.
  - **www.apc.com** (Corporate Headquarters)
    Connect to localized APC Web sites for specific countries, each of which provides customer support information.
  - **www.apc.com/support/**
    Global support searching APC Knowledge Base and using e-support.
- Contact the APC Customer Support Center by telephone or e-mail.
  - Local, country-specific centers: go to **www.apc.com/support/contact** for contact information.

For information on how to obtain local customer support, contact the APC representative or other distributors from whom you purchased your APC product.

© 2012 APC by Schneider Electric. APC, the APC logo, and InRow are owned by Schneider Electric Industries S.A.S., American Power Conversion Corporation, or their affiliated companies. All other trademarks are property of their respective owners.

990-3421B-001 **1/2012**